SCIENCE.

FRIDAY, OCTOBER 2, 1885.

THE USE OF THE FRENCH ACADEMY.

It is almost impossible to set down in exact terms the advantages which follow the establishment of any institution of learning, — a college, a university, or a learned society. It is easy to point to illustrious men who have been developed in such fellowship, and just as easy to name those of equal distinction who were not so enrolled. The publications of the body do not necessarily afford any surer evidence of the advantages of association. In the case of the French academy, it is easy to show how its plan and its methods have been approved under the most diverse forms of civil government, in generations far remote from one another, and in foreign countries as well as at home; but no analysis can be so thorough as to say what French literature would have been without the academy. The perpetuity of an institution, when it might easily be given up, is a good sign of its appreciation at home; and the imitation of its modes of procedure abroad is evidence of impartial and disinterested approbation. The French academy has both these marks of success.

There are also other modes of judging its work. The prime object of the foundation, it will be remembered, was the improvement of the French language; and, to promote this object, four specific duties were imposed upon the society: the preparation of a dictionary, and of treatises upon grammar, rhetoric, and poetry. The rhetoric and poetry were never composed, perhaps, — as an early historian, the abbé d'Olivet, intimates, — because a very little reflection would convince such a company of writers as the academicians, that there is nothing peculiar in the principles which govern literary expression in the French language. The arts of literature are as universal as the arts of cultivated speech; and the academy, from the study of Sophocles and Æschylus, Cicero and Virgil, Dante and Petrarch, Shakespeare and Spenser, could derive lessons quite as good as those which it might gain from the study of the poets and orators of France. Not so with the grammar and vocabulary of the French language. To lexicography, accordingly, their attention was at once directed. Some progress was also made in grammatical science; and the results were set forth in 1698, in a volume edited by the abbé Tailemant, and entitled 'Remarks and decisions of the French academy.'

The dictionary, however, from first to last, has been the *magnum opus* upon which successive generations of academicians have expended their force. Any one who has had a hand in the preparation of an elaborate index, catalogue, or vocabulary, — and such persons only, — can appreciate the labor of producing the dictionary of a language. For a single lexicographer to work alone, is almost futile; for him to work with co-ordinate assistants, is to multiply difficulties and questions almost in direct ratio to the number of helpers. One person can pronounce an opinion: how can a consensus be obtained in delicate matters of literary taste? We may even conjecture that it took forty times as long to produce the first edition of the dictionary on the democratic or equal-rights theory of production, which prevailed in this little republic of letters, as it would have done to produce it on a monarchic or military scheme of subordinated assistance. Was it forty times better? Even at this day, are there not many who think Littre's work far better than the latest edition of academic erudition?

Good or bad, the dictionary was of slow growth. It first appeared in 1694, in two volumes, folio. Frequent revisions have taken place, the earliest of which was begun in 1700, and published in 1718: the seventh and latest is now in progress, the first number having seen the light in 1858. Critics will vary in their estimate of the value of such a work, according to their conception of what is desirable in the dictionary of a living language. If an encyclopaedia is wanted of all the words employed by all the writers, early and recent, good and bad, — in all their uses, legitimate, obsolete, or colloquial, — including all possible derivatives, and the latest verbal inventions of technology, however barbarous, — then the dictionary of the academy will appear to be most inadequate and unsatisfactory. If, on the other hand, a standard of literary excellence is desired, — an authority to which a writer or speaker may refer if he questions the fit use of any part of speech or if he wishes to be exact and elegant in his diction, free from pro-

vincial or technical peculiarities in orthography, pronunciation, and the skilful adaptation of every word to its associates in the sentence, — then he will think that the deliberate opinion of a chosen body of literary men is far better than the *ipse dixit* of any one scholar; and he will value the collective opinion of an academy all the more highly because it is cautiously uttered.

We must not dwell too long upon this point, or we shall fail to notice other services of the academy. Its bestowal of prizes may be passed by as quite a subordinate function. Not so its election of members. To pronounce upon the comparative merits of those who are our neighbors and acquaintances, perhaps our near friends, and perhaps our annoying and troublesome rivals, is always a difficult task for the limitations of human nature. To select forty men from any great city who shall be regarded as the literary arbiters, the elect, the immortal, would be difficult if all were to be chosen at once: it may be even harder to make a selection when many candidates offer themselves for one vacant arm-chair. Probably no plan can be adopted which will work perfectly. Certainly, in politics, no plan has ever been devised for selecting invariably the best lawgivers; in religion, the best ministers; in education, the best professors. Whatever the ultimate judgment of the world may be, contemporary opinion is always questionable. It is but the ordinary result of human action that the French academy has often withheld its recognition from those who seem to have been most worthy to receive it, and bestowed its honors on others of little worth. A recent writer quotes Boileau as saying, in a fit of bad humor, "What an admirable reunion of choice spirits that is, when la Bruyère, judging his illustrious colleagues *as posterity*, wonders at finding himself seated with a Bossuet, a Fénelon, a Racine, a Boileau, and a La Fontaine!"

Notwithstanding these imperfections in human nature, and the jealousies which they evoke, there are not many who will doubt that the bestowal of academic distinctions, with a reasonable amount of safeguards, tends to the development of literary ambition. The very highest genius undoubtedly rises above such accessory impulses. We can hardly imagine that Shakespeare, Goethe, or Tennyson would have written more or better with any hope of academic preferment; but, upon men of ordinary mould, recognition, and the hope of recognition, are stimulants whose tonic effect can be clearly perceived. There are few intellects so strong as to be indifferent to appreciation, and not many who prefer the estimate of posterity to the praise of their contemporaries.

A French wit, Arsène Houssaye, has printed a very bright satire on the academy elections, under the title of a history of the forty-first fauteuil. His keen and entertaining volume is free from malice, and full of suggestions on the actual working of an academy. The point of it is, to show, that, during a period of nearly two centuries and a half, there has been a succession of men of the highest talent, who, for one reason or another, failed to be registered among the 'immortals.' These overlooked worthies are considered as occupying the forty-first arm-chair. A series which begins with Descartes, and includes Pascal, Molière, La Rochefoucauld, Bayle, Rousseau, Diderot, Mirabeau, Lammenais, Beranger, Michelet, and George Sand, with twoscore more of the non-elect, is a series which may well illustrate either the failure of human purposes, or the triumph of human weaknesses. No wonder, with such a record, that the witty writer suggests for the frontal of the academy, *Aux dieux inconnus*. But this is not fair: Corneille, Racine, Fénelon, Colbert, Massillon, Voltaire, La Fontaine, Buffon, Laplace, Cuvier, Villemain, Guizot, Victor Hugo, St. Beuve, Thiers, — all of whom are among the elected immortals, — are not to be considered as unknown deities.

But, aside from all personal considerations, there remains a question, whether an organization, like the French academy, may not perform an important service to the country, by giving its collective authority to the encouragement of excellence in the use of language. May not its criticism of its own members, its judgment of works presented to it, its bestowal of academic honors, its election of associates, its public discourses, and its serious scrutiny of the vocabulary and phraseology of the language in their combined influence, be a very powerful agency in the promotion of literary excellence? May it not become a sort of schoolmaster to the nation, incapable of making good writers out of bad, but helpful in discipline? Who can tell what has been the net gain to France from such a society? Is the clearness, the precision, the symmetry, the finish, of a good French style worth having? What would the German language be to the world if there had been a German academy at work for two hundred and fifty years smoothing its roughness, and insisting upon clear, unencumbered, and pleasing forms of expression?

LETTERS TO THE EDITOR.

**** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

Electric measuring apparatus.

In the *American journal of science* for March, Professor Trowbridge describes a form of differential cosine galvanometer, in which the action on a magnet of a strong current, moving through the fixed vertical circle of a large tangent galvanometer (of one metre radius), is balanced by the opposite effect of a weak current from a Daniell cell moving in a reverse direction through the coil of a cosine galvanometer, the fixed and movable coils having a common centre. By moving the coil of the cosine galvanometer about its horizontal axis, it is easy to secure a balance, and thus to determine the magnitude of the strong current. An obvious and simple modification of this apparatus consists in substituting for the cosine galvanometer an ordinary tangent galvanometer, with a coil of small radius having a number of turns of wire in circuit with a battery and rheostat. By varying the resistance in the circuit, a balance can be reached, and the strength of the current found. A mirror galvanometer thus arranged, and in direct circuit with a battery and very high resistance, or in derived circuit with a battery and tangent galvanometer, might sometimes be useful, as in studying slow variations in strong currents. Another instrument, which is likely to prove valuable for measuring strong currents, is a new form of differential cosine galvanometer, recently devised by Mr. R. H. Pierce, while a student at the Massachusetts institute of technology. The current is caused to pass in opposite directions through two concentric circles of nearly the same radius, as in Brackett's differential galvanometer; but the inner of these is capable of moving upon a horizontal axis, as in the ordinary cosine galvanomoter, and it is revolved until a convenient deflection is secured. A simple formula then gives the strength of the current. Chas. R. Cross.

The magnetic declination in 1728.

I notice, in your issue of Sept. 18, a note, over the signature 'C. A. S.,' criticising certain statements in regard to the northern boundary of North Carolina, contained in bulletin No. 13 of the U. S. geological survey. A more careful perusal would have shown the writer that the points criticised are contained in an extract from 'Geology of North Carolina,' by Prof. W. C. Kerr, 1875, and that the author of the bulletin is not responsible for them.

Henry Gannett.

Washington, D.C.,
Sept. 21.

Composite portraiture.

Shortly after the publication of my article on 'Composite portraiture' (*Science*, Aug. 28), my attention was called to an article by Mr. W. E. Debenham in the *Photographic news* of April 24, 1885, wherein is figured an arrangement for combining optically more than two photographs, which corresponds very nearly with what I had in mind when I penned the last sentence of my article. I have since thought of other methods of solving the problem, but have not had the opportunity of putting them to a practical test. I was glad to find in the same journal (April 17) that Mr. Galton had been giving his attention to the same subject. He says, "There is nothing respecting composites that I should more gladly hail than the invention of a simple optical method of combining many images into one, so as to judge of the effect of a photographic composite before making it."

I also omitted to refer in my article to an important application of the stereoscopic method of combining two images; namely, in getting the cocomposite of two other composites, as Mr. Galton does in his 'Inquiries into human faculty' (frontispiece), and more recently, in his composites representing the Jewish type. Joseph Jastrow.

Philadelphia, Sept. 18.

Lower Silurian fossils at Canaan, N.Y.

The words 'these limestones,' in the report of Professor Hall's remarks on my paper at the Ann Arbor meeting of the American association, published on p. 220 of *Science* for Sept. 11, seem to imply that Professor Hall claimed to have known forty years since of Lower Silurian fossils in the Taconic limestone of Canaan, Columbia county, N.Y. In a recent letter to me, he states, that, in the expression, he had no intention of implying that he knew at that time of fossils at Canaan; that he referred to his knowledge of fossils at Hoosic, in a limestone which he regarded as of the same age with that of Canaan. The existence of fossils at Hoosic also, forty miles north of Canaan, is additional evidence with regard to the Lower Silurian age of the rocks of the original Taconic system of Emmons. J. D. Dana.

New Haven, Sept. 22.

Aquatic respiration of soft-shelled turtles.

In your otherwise excellent abstract of our paper on the aquatic respiration of soft-shelled turtles (*Science*, vol. vi. p. 225), not quite enough information is given in the paragraph containing the table to sufficiently explain it. We should be glad to have that paragraph read: "The following table shows the results of the analyses. In the first column is given the total amount of free oxygen taken from the water (10 litres) in ten hours by a turtle weighing 1 kilogram. The second column contains the quantity of carbon dioxide that could be formed from this oxygen; and the third column contains the actual amount of carbon dioxide added to the water by the turtle, the excess of which, over the amount that could be formed from the oxygen taken from the water, is given in the fourth column."

	O.	CO_2.	Actual CO_2.	Excess CO_2.
July 11 . .	71 mg.	$97\frac{5}{8}$ mg.	231 mg.	$133\frac{3}{8}$ mg.
Aug. 8 . .	32 "	44 "	212.7 "	168.7 "
Aug. 9 . .	39 "	$53\frac{5}{8}$ "	168.7 "	$115\frac{3}{40}$ "

S. H. and S. P. Gage.

AMERICAN FLASH LANGUAGE AGAIN.

Since writing the paper on this subject which appeared in *Science*, vol. v., p. 380, I have succeeded in finding another glossary similar to that given by Henry Tufts, about 1798, and included in that paper. I am in-

debted to D. B. Updike, Esq., now of Boston, for the use of a rare pamphlet without a title-page, giving the dying confession of Thomas Mount, then in jail at Newport, R. I., "and to be executed agreeable to my [his] sentence at Little Rest [R.I.] on the 27th of this month of May." The year unluckily is missing; but Mount was born at 'Middletown, East Jersey,' in 1764, being thus eighteen years younger than Tufts, who was born in 1746. Mount, however, served, like Tufts, in the revolutionary army, and was, therefore, to all intents and purposes, his contemporary; leading, moreover, the same wandering and predatory life, and confessing an equal number and variety of rascalities. The date of his list of words may be safely fixed about the year 1800, Tufts' being a few years earlier. It will be seen that they coincide as to many characteristic phrases, while Mount's list is on the whole fuller. I have not altered this glossary in any way, but have designated by an asterisk the words that agree substantially with Tufts's list, and have added a few notes in brackets. I insert also the preface and appendix to the glossary.

I shall be very much indebted to any one who can enable me to fix the precise date of Mount's execution, or of the publication of this pamphlet.

"The Flash company in London (of which Mountain, lately executed in Connecticut, was a member) had a language peculiar to themselves, and books printed in that language: Mount says he never saw any of those books; but Williams confessed to the publisher of these papers that he had seen them in London, and one of them in the possession of a J. S——rs, in Jacksonborough, S.C. This language has been taken notice of in some British magazines, but little information communicated concerning it; and therefore, to gratify the public, the following dictionary of the Flash language (so far as could be obtained from Mount and Williams), together with several Flash songs, and the oath they administer to flats (as they call the novices in the art of thieving) when they are admitted into the Flash society, are added.

The flash language.

A man	A cove.*
A woman	A blowen.*
A young woman	A young blowen.
A young lad	A young cove.
A house	A ken.
Play house or fair	Garf. [*Gaff*, Dickens.]
Master of the house	Cove of the ken.
Mistress of the house	Blowen of the ken.
Son	Young cove of the ken.
Daughter	Young blowen of the ken.
A gentleman	A swell.
A lady	A fine blowen.
A child	A kinicher.* [Tufts, *kinchen.*]
Hands	Dads.
Eyes	Peepers.
Head	Nanny.
Nose	Mugg.
Mouth	Mamma.
A hat	A kelp.
A wig	A busby. [Rev. Dr. Busby.]
A coat	A tog.*
A jacket	A javin.* [Tufts, *jarvel.*]
A shirt	A smisk.* [Tufts, *smish.*]
Breetches (*sic*)	Kicksees.*
Stockings	Leg-bags.*
Boots	Quill-pipes.*
Shoes	Crabs.*
Buckles	Latches.
Cash	Lowr.* [Tufts, *lour.*]
A watch	A trick.*
A guinea	A quid.*
A dollar	A wheel.*
Money of any kind	Bit.
Bad money	Blue bit.
Passing bad money	Ringing blue bit.
Gold in plate of any sort	Ridge.
Silver plate of any sort	Wedge.
Coppers	Maggs.
Silver spoons	Wedge feeders.
A horse	A pred.* [Tufts, *prad.*]
A horse-stealer	A prednapper.*
A sheep	A woolly bird.
A knife	A chive.
A pair of pistols	A pair of pops.*
A sword	A lash.
A crowbar	A gentleman.*
A thief	A prigg.
A gambler	A sharp.
A blanket or sheet	A spread. [Tufts calls a saddle *a spread.*]
A bed	A dause.
Dry-goods	Chattery.
Cards	Broads or flats.
A pocketbook	A reader.
A note of any kind	A sereen.
Ribbons	Dobbins.
Bread	Pinum.
Butter	A spread.
Cheese	Caz.
Victuals of any kind	Grub or peck.
Rum	Suck.*
Drunk	Sucky.
A bottle	A glaze. [Tufts applies this word to *a square of glass.*]
Sugar	Pellock.
Tobacco	Weed or funk.
Tobacco-smoke	Blast of flumer.
Thief's girl	Blowen spenie, or mush.
To take	To hobble.
To lose	To sweet.
A goal	A quod or a quae.* [Tufts, a *qua.*]
A goalkeeper	A quod or quaecall. [Tufts, a *quakeeper.*]
A constable	A horney.*
A sheriff	A trapp.
A judge	A beeks. [*Beak*, English slang.]
A clergyman	A dull-gown's-man.
The law	Pattur.
The devil	The crimson cove.
Hell	The crimson ken.
The moon	Oliver's leary.* [Tufts, *Oliver.*]
The sun	Phoebus.
A fit night for stealing	A good darky.
A town	A wile.
A vessel	A barkey.
Lewd women	Cats.
A coach	A rattle.
Country people	Flats.
The highway	Bonny-throw.
Picking pockets	Diving.
One that turns evidence	A snitch.
One that robs a wagon on the highway	A drag.

Flash phrases.

*Peter (a watchword)	Somebody hears us. [Tufts, *take care of yourself*]; also an iron chest where cash is kept.
Lea (another watchword)	Look who comes.
Nose the cove	Watch the man, and see where he goes.
Go weed the cove	Go speak to the man.
Stow your weeds	Hold your tongue.
*I am spotted	I am disappointed, somebody saw me. [Tufts, *like to be found out.*]
Let us sterry	Let us make our escape.
Rumble like a miza	Wash my clothes.

Knuckling	Picking of pockets.
*Doing the cove of a trick	Taking a gentleman's watch.
A snow rig	Stealing clothes out of doors.
Taking chattery upon the lift,	Taking goods in the daytime.
*The evening or morning sneak	Goods taken early in the morning, or late in the evening.
A scamp	Robbing a gentleman on the highway.
*A dub	Opening a door with a false key.
*Cracking a ken	Breaking into a house.
*Open a glaze	Going in at a window.
Flying the lue	Going up or down a chimney.
Knocked down upon the crap,	Condemned.
Turnips	Acquitted.
Naptatees	A man to be flogged.
Knocked down upon the slum,	A place of confinement, or castle.
I have done the cove out and out	I have killed a man.
I have queered the quod	I have broke prison.
*I'm in slangs	I'm in irons.
*I'm napping my bib	I'm crying.
*Ready to be topped	Going to be hanged.

The same pamphlet adds the following: —

"The Oath at the Admission of a Flat into the Flash Society: —

"The oldest Flash cove taking the Flat by the hand, asks him if he desires to join the Flash Company. The Flat answers, Yes. The Flash cove (head man) bids him say thus: —

"'I swear by —— that to the Flash Company I will be true; never divulge their secrets, nor turn evidence against any of them; and if a brother is in distress, that I will hasten to relieve him, at the risk of my life and liberty; and if he suffers, endeavor to be revenged on the person or persons who were the means of bringing him to punishment.' After taking the above, or a similar oath, the Flat receives a *pall;* i.e. a companion, and they two are sent out upon some expedition.

"N.B. By the confession of Mount and Williams, it appears the Flash Company have spread themselves all over the continent, from Nova Scotia to the remotest parts of Georgia; that the principal seaport towns are their places of general rendezvous; and that the number of the society at present, are from about seventy to eighty, males and females. They have receivers in the principal towns of each State, who not only receive the stolen goods, but point out shops and houses for them to break into and plunder.

"☞ Sometimes they swear by God, and sometimes by the Devil: when they use the name of God, they swear by the Old Cove,' who knows all things; and when by the Devil, by the Cove of the Scarlet Ken!"

Henry Tufts mentions no such organization as this, directly or indirectly; but the facility with which he found accomplices and places of concealment everywhere, from Maine to Virginia, would seem to render such a league very probable. T. W. Higginson.

Cambridge, Mass.

AN AVERAGE DAY IN CAMP AMONG THE SIOUX.

On the day designated for a journey every one is astir, while the stars are still shining. Those who sleep late are wakened by the crackling of the leaping blaze. Shadowy forms are moving about the entrance to the lodge, and the boiling kettle warns the sleepy one that he had better be up and ready for breakfast. To slip out into the cool morning air, to dash the water over the face and hands, and dry them on the tall grass, is the work of a moment; and, with a little shaking together, every one is ready for the morning meal. This is portioned out by the wife, and each one silently eats his share. The baby still sleeps on its cradle-board, but the older children are relishing their broth with the vigor of young life. As each one finishes, he passes his dish to the matron, springs up, and leaves the tent. When the mother has eaten, she too goes out, and, with rapid steps and bent form, passes around the outside of the tent, pulling up the tent-pins used to hold the tent-cloth taught, and throwing down the poles which support the smoke-flaps. If there is an adult female companion, she takes out the round, slender sticks which fasten the tent-cloth together in front. The two women then fold back the cloth in plaits on each side, bringing it together in two long plaits at the back pole; and this is now tipped backward, and allowed to fall to the ground. The cloth is loosened from the upper part of the pole, and rapidly doubled up into a compact bundle. The baby, who has wakened and lain cooing to the rattle of blue beads dangling from the bow over its cradle-board, gives a shout as the sunlight falls in its face, and watches the quick motions of the mother throwing down the tent-poles, thus leaving the circle free of access. It is the leader's tent which first falls as a signal to all the others.

Meanwhile the boys are off with many a whoop, and snatch of song, gathering together the ponies. The men are busy looking after the wagons, or else sit in groups and discuss the journey and the routine of the intended visits, or attend to the packing of the gifts to be bestowed. All visitors are expected to bring presents to their hosts. The younger children run here and there, undisturbed in their play by the commotion. Soon the boys come riding in, swinging the ends of their lariats in wide circles, and driving before them a motley herd of ponies, some frisking and galloping, and others in a dogged trot, none following a path, or keeping a straight line, but spreading out on each side in the onward movement. As they come abreast with the dismantled tent, the women, without any break in their talk, make a dash at a pony, and generally capture him. The animal may, if he is good-natured, at once submit to be packed, two poles on each side, the packs containing the gala dress: bags filled with meat and corn are adjusted like

panniers. Between the poles, which trail behind, a skin or blanket is fastened; and here the young children and the puppy have a comfortable time together as they journey. There are enough ponies for all the men and women to ride, and colts running along beside.

If wagons are to be used in travelling, the tent-poles are tied on each side of the wagon-box. The harness is dragged along by a woman, who slings the mass of straps and buckles on the pony's back, he giving a slight start as the load drops on him. The buckling is quickly done by the women, and the stores packed in the bottom of the wagon. Finally the kettle and coffee-pot are picked up; and nothing is left of the camp but circles of trampled grass, each one with a pile of ashes in its centre.

The delight of being 'off' affects every one, the older people enjoying it sedately: the young men dash about up on the hills, where they stand silhouetted against the cloudless sky. Now and then they drop from their ponies, and lie flat on the ground, while the animal nibbles unconcernedly. The women ride with the stores in the bottom of the wagon, and the men on the seat, driving. It is hard, teeth-chattering work to travel in the bottom of a springless wagon, and no fun to ford a rapid river full of quicksands; for down will go one wheel, and the water come swirling in, wetting every thing and every body. At such times the bags of provisions are held high aloft in the hands: all else must take its chance. Those on the ponies fare better; for, with the feet on the horse's neck, all goes well, unless the little fellow gets into a very bad hole, and topples over into the water. Sometimes the men take off leggings and moccasins, roll them in a bundle, tie them on the head or back of the neck, and wade over, leaving the pony to follow. Such persons generally have time enough to lie down on the bank to dry off, and from their vantage-point watch the struggles of the loaded wagon as the men spring from their seat into the stream, and tug at the wheels to save the vehicle from sinking.

All day we ride over the prairie-trails, starting up the birds, seeing the flash of the antelope, or catching sight of the retreating wolf. If location serves, about three o'clock we camp, always near a stream and timber. It is the work of a few moments to set up the tents, while the men and boys scatter with the ponies. The young girls go laughing to the creek for water, the older women cut and gather the dry wood, and in less than an hour the thin blue smoke is curling through the tent-flaps, and the kettle hanging on its crotch-stick over the fire. Each bundle of bedding is thrown down in the place its owner is to occupy, and it will be untied and spread when needed.

There is a fascination in lying on the grass after a hard day's ride, and watching the settling of a camp. The old men gather in groups, and smoke the pipe. The young men lie at full length, resting on their elbows, their ornaments glistening in the sunlight as these gallants keep watch through the swaying grass of tents where coy maidens are on household cares intent. It is not unlikely that more than one youth is planning how he can best gain access to his sweetheart, and speak a few words to her when she goes for water to the creek in the early morning; and it is equally possible that similar thoughts are flitting through the girl's head. The creek or the spring is the trysting-place for lovers, but the chances for a word are hard to gain.

It is against etiquette for a young woman to speak to any man in public who is not a near relation; and such a one, by the law of the gentes, can never be a lover. But young hearts are stronger than society restrictions; and so when the girl, accompanied by her mother or aunt, goes for water in the early morning, she will sometimes drop behind her chaperone, and the young man, who has lain hid in the grass, darts forward, swiftly and silently, and secures the favored moment. Should the mother turn, he as instantly drops in the grass; while the girl demurely walks on, keeping her secret.

The small boys have already fallen into games, and are shooting arrows of barbed grass. From within the cone-shaped tents comes the sound of the chatter of the women, broken now and then by loud laughter. This might arise from the practical joking of the mother's brother. Such a relative is privileged in the home, and the source of many sports. While the women are cutting up the meat for the evening meal, and preparing the corn-cake, the young man, lounging in the shadows of the tent, has improvised a drum, captured his small nephew, and breaking into song, bids the little fellow dance for his supper. He obeys with a zest, his scalp-lock, and the flaps of his breech-cloth, snapping to the tune. The little sister, having secured a premature bite from the mother, stands diligently eating, as she watches her brother's antics, stimulated by the mischief-loving uncle.

There are shiftless folk among Indians, persons who are always borrowing from their more forehanded relatives; but not all borrowers are of this class. A custom prevails concerning borrowing a kettle susceptible of easy misconstruc-

tion by our own tidy housewives; that is, that it is expected, when a borrowed kettle is returned, that there will be a small portion of the food which has been cooked in the kettle remaining in the bottom of the pot. The language has a particular word to designate this remnant. Should this custom be disregarded by any one, that person would never be able to borrow again, as the owner must always know what was cooked in her kettle.

Great indignation was the result of the action of a white woman, who returned a scoured kettle. She meant to teach a lesson in cleanliness; but her act was much talked over, and interpreted as fresh evidence of the meanness of white folk!

Soon the savory odors give token that supper is ready. Dishes are set in the traditional places occupied by the members of the family, and the food ladled out, and portioned to each person. The little girl is sent out to call the men in. There is no formality about the family meal. If the father is a religious man, he may take a bit of his food, lift it up, and drop it in the fire; the act is without ostentation, and apparently unobserved by the others. Sometimes the children take their supper together outside the tent. The mother seldom eats until all are fully served. She may join her children with her portion; or if she has female companions in the tent, they will draw together, and gossip over the meal. Every one falls to with zest, and the pot is generally emptied.

After eating, all lie down, stretching out in the tent, or going outside if the day is fine, and resting in the long slanting sunlight. As the air cools, a fire is kindled; and here grouped about the companionable blaze we watch the stars come out. Some persons doze, some discuss the journey, or recount reminiscences of former times: the women gather together and complete the story of the day; while the children chase the fireflies, or subside into drowsy listeners. Across the hum of voices is borne the song of a young man, who, hidden in the grass, lies on his back drumming on his breast as he sings. There are no urgent demands upon any one. The matron has no dishes or linen to wash, or scrubbing to do; there is nothing to clear away after the evening meal: the single pot is emptied, and set to one side. No transitory fashions perplex the fancy of the maiden, no lessons to learn harass the child. The men talk or sing, unconscious of money making or losing, or questions in science or art. To the people, no great disasters are probable, no great successes possible. The stars above silently hold their secrets, the unmarred prairie tells no tales, and the silence of uninquisitive ignorance shuts down upon our little life.

To one thrust from the midst of civilization into so strange a camp-circle, the summer days hardly bring a realizing sense of the great estrangement between the two orders of society. It is only when the frozen calm of winter obliterates every touch of color and individuality of outline in the landscape that it becomes possible to gauge fully the mental poverty of aboriginal life. The cold nights when the tent freezes hard so that it sounds like a drum, and the frost lies thick on the bedrobes, make one dread to rise early; and the sun is often up before the fire is kindled, and the kettle bubbles with the morning meal. After looking to what comfort it is possible to give the ponies, and having gathered in the wood, the outdoor work of the day is over.

In winter the tent is made warmer by putting a lining around to half the height of the tent-cloth, and by banking without and within, stuffing with grass the space between the lower edge of the tent-cloth and the ground to keep out the wind. This done, and with plenty of wood to feed the fire, one can be passably comfortable. During the day the women are busy making clothes, mending moccasins, or embroidering gala garments with porcupine quills or beads: the men, if not out trapping, are engaged in fashioning pipes and clubs, or shaping spoons on the ball of the foot. The winter is the season for story-telling, and many hours of the evening are spent in this enjoyment.

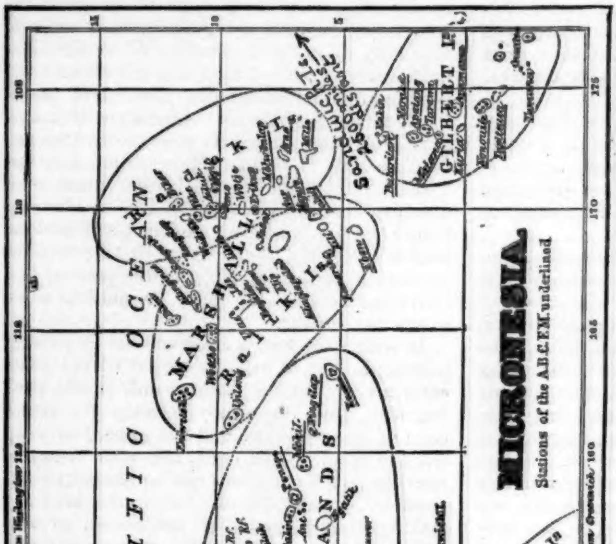
The cold season brings pleasures to the children, — snowballing, sliding down hill on blocks of ice, or standing on a flat stick and coasting swiftly, balancing with a pole. The glow on the faces of the little ones as they run in breathless from their sport to meet the welcome of the group within the tent, is about the only zest the days bring.

ALICE C. FLETCHER.

THE CAROLINE ISLANDS.

MICRONESIA, or the 'Little Islands,' is a fitting name given to that portion of the Pacific Ocean lying between 134° and 177° longitude east from Greenwich, and from 2° south to 20° north latitude. Within these boundaries it is estimated that there are not far from one thousand islands, divided into four groups, — the Gilbert, Marshall, Caroline, and Ladrone. The Ladrone Islands on the north, between 144° and 146° longitude, were discovered by Magellan

in 1581, and are under Spanish rule, being used for a penal settlement. The native population on this group is entirely extinct. The Gilbert and Marshall Islands on the eastern side of Micronesia are all of coral formation, and with few exceptions are very small in area.



The largest group of the four is the Carolines lying north of the equator between 134° and 165° east longitude. They were discovered in 1528 by Alvaro de Saavedra, and are usually divided into the eastern, western, and central Carolines; but there are no definite boundaries to these sections. On the western end, the largest islands are Pelew and Yap. These, with Ponape and Ruk in the central, and Kusaie on the eastern sections, are the only high islands, the rest being of coral formation, and rising but a few feet above the level of the ocean. The highest point on Yap is about 1,200 feet, while the top of Ponape is said to be not less than 3,000 feet. Ruk, or Hogoleu, is an archipelago encircled by an immense barrier-reef some 150 miles in extent. The lagoon which is thus enclosed, though irregular in shape, is not far from thirty miles in breadth, within which are several high islands varying from 200 to 1,000 feet in altitude.

The climate of this region is, of course, tropical, the thermometer at Ponape ranging from 70° to 87° F. The three principal products which thrive upon coral islands, and are the main support of human life, are the cocoanut-palm, which grows wild, the bread-fruit, and the pandanus or screw-pine. Taro is also produced on some of the islands. On Kusaie, Ponape, Ruk, and Yap, there is a much larger range of products. It is said that on Ponape there are not less than a dozen different varieties of bananas. Since American missionaries have resided there, various tropical fruits have been introduced, and also animals. These high islands are covered with forest-trees, and abound in pigeons and wild birds.

It is difficult to estimate the number of inhabitants within the group. Ponape has about 5,000, Ruk about 12,000, Yap 8,000 or 10,000. The people belong to the brown Poly-

[1] Map loaned by the Amer. board of comm. of for. miss.

nesian race, having straight hair. They are tall, well formed, and vigorous, much addicted to war, yet not characteristically savage. Rev. Mr. Doane of Ponape describes the Rukite as of "a soft saffron tinge, his form symmetrical, limbs round, and of good length between joints, step easy, eye round, black, and lustrous, not dimmed by the use of ava or toddy from the cocoanut-blossom, lips rather thin for a Micronesian, hair wavy and long. I thought him a fine-looking native. Some of the women are quite beautiful." The islanders are skilful in navigating their proas, which are fitted with outriggers; and they often make long voyages without compass, though not infrequently a boat-load is drifted away, and is lost. The people throughout the islands formerly tattooed themselves, a custom which is rapidly passing away. Their houses are simply roofs on posts about four feet from the ground. In these attics they sleep with a wooden pillow and a mat covering. Until recently, there was little clothing seen on men or women. There was no marriage-rite known, though the pairing of men and women was respected. Each of the Micronesian groups has a distinct language, and within the Caroline islands the variations are more than dialectic. There are at least six or eight distinct languages within the group.

The Caroline islander as found, was not an idolater, though full of superstition. He had neither images nor temples, though certain places were avoided because he believed that they were inhabited by spirits. In a few places priests were found whose aid was sought in curing the sick. As to the government of the islands, there has been hitherto no attempt on the part of foreign powers to exercise control over them. Each island has its chief, who is absolutely independent, though sometimes controlled by a council of the people. His authority is hereditary, and is derived in the line of the mother. On a few of the islands, there is more than one tribe, in which case each division is ruled by its own chief. There is no confederation known throughout the group.

A remarkable change has been effected in the islands within the last generation. In 1852 American missionaries, under the care of the American board of foreign missions, were located on Ponape, and have since occupied Kusaie, Ruk, and the Mortlocks. From these points they have extended their labors through the agency of native helpers to several islands of the group, as well as into the Marshall and Gilbert Groups. There are at present twelve American missionaries, men and women, to be found on the islands, who are aided in their work by the Morning star, a barkentine with auxiliary steam-power, which enables them to visit the islands, and locate the native helpers. On its present voyage this vessel is expected to land teachers on the island of Yap. Since the landing of these missionaries, the whole condition of society on many of the islands has been entirely changed. In some places the whole population is found in schools; and on most of the islands occupied by Christian teachers the people are respectably clad, and are accepting the civilization and religious truth offered them. Within Micronesia the missionaries have under their care more than forty churches, with over four thousand church-members.

As to the question of the sovereignty of the Carolines, which is now in dispute between Spain and Germany, it may be said that, though Spain may claim possession on the ground of prior discovery, she has not for three centuries enforced that claim, or occupied any of the islands, unless it may be a single one nearest her Philippine possessions. Germany has no claim save on the ground that a dozen traders, more or less, have taken advantage of the improved condition of affairs, due to the labors of American missionaries, and have carried on a small trade in the dried fruit of the cocoanut. The interests of civilization and humanity do not require that either of these nations should assume control.

E. E. STRONG.

SCIENCE IN COMMON SCHOOLS.

Bones.[1]

BONES are the framework of the human body. If I had no more bones in me, I should not have so much shape as I have now. If I had no bones in me, I should not have so much motion, and grandma would be glad; but I like motion. Bones give me motion, because they are something hard for motion to cling to. If I had no bones, my brains, heart, lungs, and larger blood-vessels would be lying round in me sort of loose-like, and might get hurted; but not much, lest it is hard hit.

If my bones were burned, I should be all brittle, and you could crumble me up, because all the animal would be out of me. If I was soaked in a kind of acid, I should be limber. Teacher showed some bones that had been soaked. I could tie a knot in one. I had rather be soaked than burned.

Some of my bones don't grow snug, and close to my other bones, like the branches to the trunk of a tree do; and I am glad they don't; for if they did, I could not play leap-frog, and other good games I know.

[1] Composition by a boy in one of the lower grades of a New-England grammar school.

The reason they don't grow that way is because they have joints. Joints is good things to have in bones. There are two or three kinds. The ball-and-socket joint, like my shoulder, is the best. Teacher showed it to us, only it was the thigh-joint of a cow. One end was round, smooth, and whitish: that was the ball end. The other end was saucer-like: that is the socket, and it oils itself.

Another joint is the hinge-joint, like my elbow. It swings back and forth oiling itself, and never creaks like the schoolroom-door does. The other joint aint much of a joint. That is in the skull, and it don't have no motion.

All of my bones put together in their right places makes a skeleton. If I leave out any, or put some in the wrong place, it aint no skeleton. Cripples and deformed people do not have no skeletons.

Some animals have their skeletons on the outside. I'm glad I aint them animals; for my skeleton, like it is on the chart, would not look well on my outside.

This composition is an excellent illustration of 'how not to do it.' An illustration of so-called science *teaching*, telling facts to children instead of leading them to find out facts for themselves, of learning instead of the acquisition. In this case the fault lies partly with the topic. A child learns by sight and by touch, not by *faith*. While it is possible for an excellent teacher to illustrate an abstract or an abstruse subject which cannot be seen or touched, so that the child may grasp the essential points, it is not probable that one in a hundred of those now engaged in teaching will do so without too great an expenditure of time. Teachers as well as housewives often fail to remember that children and uneducated persons are able to grasp but one idea at a time. The above composition shows plainly that too many words were used in the attempt to give too many ideas to the child in too short a time.

Professor Hyatt ('Science guide' No. 1., p. 6), has well expressed the creed of those who are advocating elementary science in public schools, when he says, "The idea is not to teach, but to lead the mind to work out for itself the simple physical problems herein described, and thus almost unconsciously to arrive at the conclusions.

"The time spent in making each step is, therefore, of no consequence. The quality of the knowledge gained, and not its quantity, is alone to be considered. This sort of knowledge cannot be given by another to the scholar: it must be gained by work."

The following composition, also the work of a boy in a New-England grammar school, is an example of 'how it may be done,' and done, we venture to say, successfully; for, in clearness and accuracy, it will compare favorably with the answers to examination questions on similar topics written by boys of seventeen or eighteen in our higher schools.

Iron Ores.

This morning the teacher passed each boy three specimens. One of the boys brought his specimens to the desk, and the teacher tried them with a magnet. One of them was reddish, the other was yellowish, and the other was black. The yellowish one and the reddish one we found was not magnetic, but the black one was magnetic. These specimens were all iron ore, from which iron is obtained. From the black ore, we found that the best iron was obtained from it.

We were then told to rub each specimen on a piece of paper. The red specimen made a red mark, and the yellow specimen made a yellow mark. From the other specimen, which was black, the most of us could not make it mark on account of its hardness; but our teacher told us if they were some powder on it, we could make it mark a black streak.

Then the teacher took some small pieces of the yellow ore and put them in a test-tube, and held the tube over the flame of an alcohol-lamp, and each line filled around to see what it formed in the tube, which was water. There was no water in the tube when the ore was put in, therefore it must have come from the ore. This ore is called limonite or bog-iron ore, because it has so much water in it, and is found in wet, marshy places. The name of limonite came from a word meaning meadow.

The teacher then took them out of the test-tube, and tried them with a magnet, and found they were not magnetic. It was proved that they were not pure iron, because they would not stick to the magnet.

We found that these pieces of iron-ore contained iron and oxygen, therefore they were iron oxides. When these pieces were rubbed on paper they made a streak like the red ore. The name of this red ore is hematite, which means blood-red. Hematite is composed of iron, oxygen, and no water; and once it was supposed to be limonite, and the water driven out of it by the heat of the earth.

Teacher then took the pieces of limonite which was heated in the test-tube, and put them in a piece of charcoal, which is a form of carbon, and blew the flame of an alcohol lamp on the charcoal by a blowpipe. After she got the most of the oxygen out of the pieces, she then took them on a piece of paper, and tested them with a magnet, and found the smallest pieces were magnetic, because they were heated the most. The black ore is magnetite, which contains the best iron. ELLEN H. RICHARDS.

The composition on bones, by a boy nine or ten years old, who has been made a subject for science-teaching, illustrates very strongly the

dangers that lie in the way of a too early introduction to too difficult matter. It is by no means a bad specimen of the way in which a scientific lecture is reproduced in the young student's mind; it is, on the contrary, a remarkably favorable one. A great part of the information conveyed has been properly assimilated, and made a part of the real furniture of the boy's mind; and it is reproduced with vigor and originality. It is very different from a mere committing to memory of hard names, which might have been the effect; but it has still important warnings to convey.

The wise teacher will always take the examination-papers of her brighter pupils as a sure and searching test of the value of the instruction which she has endeavored to give. There are three plain and easy lessons which she will derive from the one before us. She will shut her eyes to the unchildlike and uncanny air of 'smartness,' — the *gamin*-like quality which is attractive in a French novel, but nauseating in real life in America; and she will attend only to the scientific ideas expressed. She will draw two morals for her next lesson on bones, and one for her scientific teaching in general. She will see that the connection between bones and the general idea of motion is far too difficult to be given to a young child. Hereafter she will tie strings or elastic bands to sticks, perhaps, and show how particular movements may be effected; but she will omit to give principles in regard to the production of motion in general. She will also refrain from calling the bony outside of certain animals a skeleton. Such fanciful extensions of the meaning of popular names will do for older children; but older children can also learn to say 'exoskeleton' and 'endoskeleton,' and the content of a name in a child's mind is a matter which is no more to be trifled with than the logical sequence of ideas. In the third place, the teacher will notice — what she has often noticed before — that it is a hazardous thing to supply a young child with reasons. Facts may be safely given in any amount, so long as they are simple, and such as he could find out for himself if put in the proper circumstances; but reasons should be given as sparingly as possible. He has not yet any means of knowing what kind of a thing a reason is; and it is of the utmost consequence that he should not be hopelessly set adrift on this subject. Probably the most characteristic of all the qualities of the untrained mind is the facility with which it is able to give a reason for every thing that happens.

Christine Ladd Franklin.

THE RESULTS OF THE KRAKATOA ERUPTION.[1]

In the spring of 1884, Messrs. René Bréon and Korthals sailed from France, under instruction from the minister of public instruction, to explore the island of Krakatoa, and study the effects of the great eruption of Aug. 27, 1883. When they arrived at the bay of Bantam, they gradually passed from islands thickly covered with a tropical vegetation, to those burned and devastated by the rain of cinders and the tidal-waves. Upon Cape St. Nicolas, the cocoa-trees were parched and yellow; and the only signs of vegetable life were the young shoots of the year, which were springing from the tops of the half-dead trees. On the coast of Bantam, the shock of the wave had broken off a reef twenty to twenty-five metres high, and ingulfed it beneath the sea. The wave which rushed with such force upon this coast destroyed the forest for a distance of three hundred or four hundred metres inland, leaving nothing standing except the great Ficus religiosa, which stretched their dry and barkless stems toward the heavens. But already nature was repairing the damage, and the powerful tropical vegetation was springing up amid the ruins.

In the bay of Lampong, there were signs of a more powerful shock. A band of land devastated by the tidal-wave rises to a height of twenty-five metres above sea-level, and the destruction begun by the sea was still farther extended inland by the rain of burning cinders which were thrown from the volcano. They proceeded up the bay, and anchored in front of the site of Telok-Betoeng, which was destroyed by the tidal-wave. It was situated on a plain but a few feet above sea-level, and was the home of a number of European merchants and dignitaries, in addition to the Malay population. The place where the town stood is now a marsh, covered with cinders, and incumbered with trunks of trees, beams, and *débris* of all kinds. A little back of this, on the sides of a hill, some European houses, and a native hut, still remain, — thanks to their position above the reach of the waves. A small river flows to the sea through the old site of the village; and near this stream, in a dense forest three kilometers from the seashore, there is a native fishing-vessel, lying where it was tossed by the inrushing waters. Near by there are others; and, a few hundred metres from there, on a bend of the stream, a large steamer, the Barrow, forms a bridge from bank to bank. It is reported that the water rose to a height of three hundred metres, which cannot be a great exaggeration of the facts.

Leaving Telok-Betoeng, they proceeded to Sebuku, one of the group of islands to which Krakatoa belongs. This is not a central volcanic cone like its neighbors Sebesie and Krakatoa, but rather a fragment of land detached from Sebesie or Sumatra by some ancient eruption. The forests on this island are much more confused than those on the border of the bay of Lampong, and one can readily see that the centre of volcanic activity is being approached. Con-

[1] Condensed from *La nature*.

tinuing the voyage, the travellers arrived at the island of Sebesie, and here the destruction was complete, — hardly a bit of herbage, hardly a trace of life, remained. A coat of gray cinders mixed with pumice, and fragments of a greenish, glass-like substance, covers this island to a depth of ten metres. From a distance, the sides of the hills are seen to be furrowed by ravines; and, upon nearer approach, it is found that the torrents of rain that fell during the last monsoon have washed out deep furrows in the light layers of cinders. At the bottom of one of these ravines, in the midst of the remains of houses and household utensils, fifty skeletons were found lying about. Sebesie was inhabited by two thousand Malays; and the unfortunate natives, unable to escape the hail of burning projectiles, resigned themselves to their fate, and gathered together to invoke divine protection by means of their Koran, which was found in many places scorched and torn among the ruins.

TELOK-BETOENG BEFORE THE ERUPTION.

The commission soon left this island, and directed their course towards Krakatoa, the object of their visit. On the way, they passed the place where Steers and Calmayer islands had been formed in shallow water by the accumulation of ejected matter; but, to their surprise, they found that no traces of these islands remained. Their disappearance is easily explained, for so light a substance would be easily removed by the waves. The depression between these two ephemeral islands is much shallower than before.

Passing on through patches of floating pumice, the steamer neared Krakatoa, upon which could be seen undulating lines similar to those on Sebesie. The north side of the island is split from east to west, one-half having been swallowed up in the sea. The cliff thus exposed to view from the sea is composed of various volcanic strata, intersected by many-colored veins of different sizes, which are the vents by which the subterranean fires have forced the molten rock to the surface to build the cone. A light smoke hung above the cone, and from the distance it looked as if volcanic activity had not yet ceased. Upon nearing the shore, the cause was plainly seen. Stones of all sizes were falling from the cliff, sending a spray into the air, while the finer dust floated upward, and gathered in a cloud about the summit of the volcano. This continual fall of rocks is the result of the expansion caused by the rays of the sun as they strike upon the black walls of the cliff. This is proved by the fact, that the fall was greatest when the rays shone full upon the cliff, and nearly ceased in the evening. At the base of this cliff the sounding-line showed a depth varying from fifty to three hundred metres in a square surface of thirty-three kilometres, which once was elevated above the sea. The only remnant of this ingulfed portion of the island is a rock about a mile to the north of the cliff. Before the eruption, the island of Krakatoa was made up of three cones, — Danan and Perboewatan, which disappeared with the northern half of the island, and the much higher Rakata, which still exists.

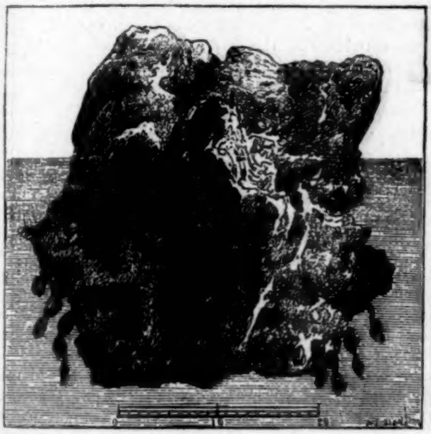
The exact time of the eruption is not known; but Capt. Hollmann of the German ship Elizabeth, which passed in front of Anjer on the morning of May 20, noticed a parasol-shaped column of smoke rising to a height of eleven thousand metres on the Perboewatan, and soon afterwards a fall of light cinders lasting several days. Up to Aug. 26, the eruptions were intermittent and somewhat light; but from this day they increased in intensity. Very violent noises were heard at the same time that a thick cloud obscured daylight. These lasted up to the morning of the 27th, the strongest being from five to eleven o'clock in the morning (Batavia time). The most startling were produced at ten o'clock, probably the time when the island divided. The falling in of these

TELOK-BETOENG AFTER THE ERUPTION.

huge masses of earth piled up the vast waves which swept with such destructive force upon the islands of Java and Sumatra, and destroyed forty thousand human beings. Some lesser explosions were heard during the rest of the 27th, and the day of the 28th.

Scarcely any thing is known of Krakatoa before this eruption; but there are records of a similar, though less extensive, eruption in May, 1680. For two hundred years it has fallen into an uninterrupted sleep to be awakened with such terrible violence in 1883. At the time of the eruption it was uninhabited. There are certain legends handed down by the natives of the neighboring islands from which we can see that the existence of Krakatoa as an eruptive volcano antedates Javanese heroic history.

The travellers had little difficulty in landing on the extreme west of the cliff, on the shores of a small inlet following a deep ravine newly eroded by the rain through both the light material recently ejected, and



PUMICE FOUND FLOATING FIFTEEN MILES FROM MADAGASCAR, AUG. 13, 1884 (*La nature*).

the underlying older solid lava-beds. The ashes at this place were from sixty to eighty metres in depth, and were well separated from the black and gray lava by their white color. Although more than nine months had elapsed since this matter had been thrown out, still, in some places, it was so warm that steam escaped from among the ashes, leaving a layer of sulphur and sal-ammoniac behind. A bituminous odor was also noticeable, and this was no doubt due to the dry distillation of the vegetation buried beneath the warm cinders. After taking photographs, they left the island, and proceeded toward Lang and Verlaten, two small islands, probably a part of Krakatoa torn asunder during some remote eruption. These islands, like all their neighbors, are covered with a mass of pulverized pumice thirty metres deep, furrowed by the rain. The aspect of the islands reminds one of the front of certain glaciers; but the temperature of 40° C., due to the absorption of the sun's heat, will not allow this deception to last long. The surface of these two islands is much increased by the piling up of material on their sides during the eruption. To counteract this increase of surface, an island, Poolsche Hood, which was situated to the east of Verlaten, and a reef, Polish Hât, which rose to the west of Lang, have disappeared. Save the escape of steam, mentioned above, and which is independent of volcanic activity, absolute tranquillity reigns in these desolated regions. There are neither fumeroles, nor jets of vapor under pressure, which generally persist a long time after the eruptive period. The natural equilibrium is re-established. But it is to be remembered that the fires merely sleep, and that probably some day they may awake from their lethargy.

In conclusion, it may be well to give a brief account of the geological structure of Krakatoa and the neighboring islands. The series of volcanic islands to which Krakatoa belongs, follows a line extending N.N.W., obliquely across the straits of Sunda, and forming an angle with the lines of the principal volcanoes of Java and western Sumatra. The point where these three lines meet is found approximately at Krakatoa. The base of the island is made up of solid columns of a crystalline basalt, and of augite and labradorite, all very basic, and in which pyroxine augite made an abundant part of the second consolidation. These basic formations have been found at Krakatoa, Sebuku, Protection, and Sebesie. Above these various basaltics is a compact column of andesite, becoming more and more acid in its upper part, and nearly barren of the microliths of augite which are abundant near its base. There are layers of pumice between the sheets of lava, showing that the eruptions of the volcano have been of two kinds succeeding each other.

The ashes ejected by the last eruption are composed principally of a light spongy pumice, and of irregular blocks of a compact dark glass, in which may be distinguished the brilliant crystals of labradorite. This acid glass (70-72 in a hundred parts of Si.) presents a very simple constitution. It contains a good number of crystals (first consolidation) of labradorite, augite, hypersthene, and titaniferous oxide of iron; also elements of the second consolidation in the form of felspathic microliths, attributable to oligoclase. In addition to these truly volcanic matters, we may mention some *débris* in terrains, composed of fragments of quartziferous diorite, and balls of a calciferous marl, regular, and polished by erosion with pumice. These *débris* products are relatively rare; and, to all external appearance, the islands are one mass of volcanic ash.

TOUGHENED GLASS.[1]

UPON investigating the De la Bastie invention of the so-called toughened glass, Mr. Frederick Siemens has found that the process is not a manufacturing process at all, but, rather, a somewhat impracticable

[1] Condensed from a paper read before the Society of arts, London.

addition to known methods of glass-making. The new invention was based upon a very complicated and costly process. The objects were likely to have their shapes spoiled or their surfaces injured, and, in addition to these objections, the toughened glass was liable to burst spontaneously or by a sudden shock. The cooling influence, which acts from the surface inwards, is not in proportion to the bulk of the glass, but to its surface, and must always act more quickly where the surface is large in comparison with the volume: in a sheet, for instance, the edges cool more quickly than the middle, and the sheet is liable to explode.

Mr. Siemens has invented a process by which hardened glass may be manufactured and thoroughly toughened without this objection. His method consists of placing the parts of the object which have the least surface between slabs of a cold material suitable for the purpose. The edges are not exposed to this rapid-cooling process, and hence a uniform cooling of the whole mass is secured. The plan employed for various articles varies with their shapes, but each is based upon the same principle. He has three processes, — press-hardening, casting, and a third, theoretically less perfect than the other, viz., semi-hardening, or hard-tempering, which may be employed advantageously in cases where the others cannot be used, as in the case of lamp-chimneys, bottles, etc.

Press-hardened glass has now been manufactured for six years, and is constantly increasing in importance. Besides plain work, decorated sheets, inscriptions, and ornaments form an important part of the goods produced: the process is therefore one of manufacture, not simply one of hardening and toughening. The glass is so hard that the diamond will not touch it; and it cannot, therefore, be cut or bent after manufacture. It may, however, be polished, etched, and slightly ground. Its strength is at least eight times that of ordinary glass.

The process of manufacture is as follows: The glass is cut and shaped in the ordinary way, and is then exposed to the *radiant* heat of a peculiarly constructed furnace until quite soft. As soon as it has attained the required temperature, it is placed between cold metal plates to be cooled down with a rapidity which varies with the thickness of the glass, but is always very great. The heating of a sheet of glass of ordinary thickness requires one minute; the cooling, half a minute.

It is a remarkable circumstance that glass can be thus quickly heated and cooled without causing it to break. This is altogether due, in heating, to the fact that all the heat comes by radiation in a uniform manner. The success of the cooling is entirely due to the uniform temperature of the glass and metal plates during the cooling process. It is owing to the very high temperature of the glass during the process that it can be moulded, enamelled, and decorated at the same time it is being hardened. By this method an enamel can be produced that is as hard and refractory as the glass itself.

The hardness depends upon the rapidity of cooling; so that, if the glass is to be hardened to a very high degree, a very good conductor of heat, as copper, is used; if to a lower degree, iron is substituted; and, for a still lower degree, the iron press may be lined with asbestos or clay-stone. Much care must be used in the entire process; the furnace floor must be smooth, and be dusted with talc-powder; the whole process must be by radiation, and must be conducted uniformly.

Semi-hardened glass is made by the same process, except that, instead of using a press, the article is placed in a casing of iron provided with projecting internal ribs, which prevent contact except at a few points. The object is then allowed to cool in air. By this means a glass three times as strong as ordinary glass is produced. It is absolutely necessary that there shall be no draught at any time during the process, and the method can only be used for objects nearly uniform in thickness; thick-bottomed bottles, for instance, being liable to break.

The third process, that of casting, has not yet been introduced on a manufacturing scale; but Mr. Siemens considers it the most valuable of the three. The experimental castings have been very successful, and the objects consist of floor-plates, grindstones, pulleys, tramway sleepers, and various ornamental work. Mr. Siemens is of the opinion that castings might be produced with advantage for other purposes, especially to be used in connection with the building-trades.

Glass made by this process is four times as strong as ordinary glass, can be made much more cheaply, and cast into a variety of forms which it would be impossible to produce with ordinary glass without its cracking. It is manufactured in the following manner: Glass is melted in an ordinary tank-furnace, and run into moulds, as with iron castings. The process differs from that of casting iron in that a special substance is used in place of sand, and the mould and the glass inside of it are heated and cooled together. The material to be used in place of sand must be selected so as to have, as nearly as possible, the same conductivity and capacity for heat as glass. In such a case — the glass and mould forming, as it were, one homogeneous body — the glass will cool without cracking, even if the cooling process is comparatively quick, which is quite necessary. When fully heated, the glass and mould are taken out, and allowed to cool in the open air. This process differs from the other two, in that glass of any thickness may be cast, whereas in the others only glass of a uniform thickness can be made.

It will be seen from the description that these three methods, although very different from each other, are but different ways of treating differently shaped articles, and that all three are based upon the principle of keeping the whole body of the glass at a uniform temperature during the operations of heating and cooling. These processes are likely to cause an important revolution in glass-making; and it seems, that, in the future, tempered glass will bear the same relation to ordinary glass that steel does to iron.

THE RELATIONSHIPS BETWEEN DINOSAURS AND BIRDS.

Prof. B. Vetter[1] has recently published a striking article upon this question, which offers strong evidence that the view so long held of the descent of birds from dinosaurian reptiles must be abandoned. The author gives several pages to a *résumé* of the more or less discordant opinions of previous writers; but these lack of space forbids us to notice, as Dr. Vetter's own views must claim our attention.

The oldest known dinosaurs occur in the trias, and are representatives of the Theropoda and Sauropoda, — the former typical carnivores, walking entirely upon the three-toed hind-feet; the latter herbivorous, little differentiated, having the fore and hind limbs plantigrade, pentadactyl, and of nearly equal length. From this it appears that the earliest members of the dinosaur line existed long before the trias, and must have been quadrupeds, with skull, limbs, and pelvis approximating the lizard type. Of the mesozoic dinosaurs, we know at least five or six divergent lines which show more or less likeness to birds in the pelvis and hind-limbs. These do not form a single connected series gradually leading to the birds, but rather a number of divergent series. Let us examine some of these groups.

Stegosauria show many bird-like features of the pelvis and hind-limb, but in every other respect are very different from birds, having a lacertilian skull, an immense tail, and grasping fore-limbs. They are too specialized to be bird ancestors. The Ornithopoda have, with Compsognathus, usually been regarded as forerunners of the birds. Iguanodon will serve as a type of the group. It walked on its elongated hind-legs. The jaw was toothless in front, and very probably had a horny beak. The pelvis is very like that of a Ratite, though with large reptilian pubes; the femur has a third trochanter; and the tibia is as long as the femur. The foot corresponds very closely to the embryonic condition of the bird's foot. The specializations of Iguanodon, however, will not allow us to regard it as a bird ancestor. These are, the entire configuration of the skull, the peculiar tail, the absence of clavicles, the dermal armor, the structure of the fore-limb (which is much shortened). The first finger possesses a dagger-like weapon; the second, third, and fourth, hooflike, ungual phalanges; and the fifth, which diverges strongly from the others, a claw. May we not, however, imagine a more generalized form as the common ancestor of both Iguanodon and the birds? But it was merely the specializations of Iguanodon that suggested it as a bird ancestor. If we remove these, the simpler sauropodan or even lizard characters appear. Here, at least, we must not speak of homologies with the bird foot and pelvis, but only of analogies. This does not render the facts uninteresting, as they prove anew, how, by the steady operation of the same needs, nearly the same result may be produced from similar raw material, be the remaining structures never so different. For similar reasons Dr. Vetter rejects Coelurus and Hallopus from the category of possible bird ancestors.

In Compsognathus the hind-limb is remarkably bird-like, in the following respects more so than in the Ornithopoda: femur considerably shorter than tibia; distal end of fibula a mere style; astragalus anchylosed with tibia, calcaneum with fibula; tarsus, metatarsals, and phalanges exceedingly similar to those of embryo birds; (in almost all these respects Archaeopteryx comes nearer the modern bird-type, without quite reaching it.) On the other hand, Compsognathus possessed a long ischiadic symphysis, very probably long pubes, greatly shortened fore-limb, the hand clawed and three-fingered, non-pneumatic bones, a lacertilian skull, long neck and tail. Such an animal may represent a further developed side-branch of the Ornithopoda, but was already spoiled as a flyer. Dr. Vetter rejects the opinion that Compsognathus could have been an ancestor of the Ratitae, as he derives both classes of birds from a common form. The result, then, of this investigation, agrees quite closely with that of Seeley and Vogt, that there is no direct connection between dinosaurs and Carinatae at least, and probably none with the Ratitae. If, as seems in every way probable, the Carinatae and Ratitae are descended from a common ancestor, the latter cannot be derived from the dinosaurs.

[1] Festschrift der naturwiss. gesellsch. 'Isis' in Dresden, Mai, 1885. pp. 109-122.

PHOSPHORESCENCE OF MARINE ANIMALS.[1]

Ehrenberg, in his 'Das leuchten des meeres,' published in 1835, quotes four hundred and thirty-six authors who had written upon this subject up to that time; and very many additional observations have been since recorded. The property of phosphorescence is common to certain members of the Protozoa, and to the coelenterates, echinoderms, worms, rotifers, crustaceans, molluscoids, mollusks, and fishes, among the Metozoa. Fully three-fourths of Professor McIntosh's interesting address was devoted to a review of the phosphorescent forms belonging to these several groups; their distribution, and the appearance, intensity, and character of the luminosity being described in some detail. We limit ourselves to a short abstract of the concluding portion of his remarks.

As regards the causes of phosphorescence, Professor McIntosh said, "I do not deem it necessary to go into detail with regard to the numerous views which have been advanced to account for the phosphorescence of marine organisms, for these range over a very wide area, — from its production by electricity, by the constant agitation of the water, by putrefaction, by luminous imbibition, to its manifestation as a vital action in the animals, or a secretion of a phosphorescent substance. . . .

"It will be observed that in the Protozoa, the structure of the minute but often very abundant animals,

[1] Abstract of the opening address before the section of biology of the British association for the advancement of science, by Prof. W. C. McIntosh, president of the section. From advance sheets of *Nature*.

which furnish the luminosity, clearly proves that the presence of a well-defined nervous system is not required for its manifestation, the protoplasm of their bodies alone sufficing for its development. There are no glands for secreting it, and, in some, apparently no fatty matter for slow combustion. In the coelenterates the phenomena appear to be more nearly related to nervous manifestations, though in certain cases the luminous matter possesses inherent properties of its own. While in certain annelids, again, such as Chaetopterus and Polycirrus, there are glands which may be charged with the secretion of a luminous substance, it is otherwise with certain Polynoidae, in which the emission of light appears to be an inherent property of the nervous system. The irritability in the phosphorescent examples of the latter family, however, varies considerably, some, e.g., Polynoe scolopendrina, being sluggish, while others, like Harmothoe, are extremely irritable. In the crustaceans the luminosity seems to have the nature of a secretion, probably under the control of the nervous system. In Pyrosoma and Pholas dactylus a luminous secretion is also a prominent feature; and in both the latter and the annelids, decay excites its appearance, as also is the case, to a limited extent, in fishes.

"It is evident, therefore, that the causation of phosphorescence is complex. In the one group of animals it is due to the production of a substance which can be left behind as a luminous trail. The ease, for instance, with which, in Pennatula and other coelenterates, the phosphorescence can be repeatedly produced by friction on a surface having a minute trace of the material, clearly points to other causes than nervous agency. The action, moreover, clearly affects the organic chemical affinities of the tissues engaged. On the other hand, again, as in certain annelids, it is purely a nervous action, probably resembling that which gives rise to heat."

Many of the older authors connected the emission of light with the economy of the deep sea: the same notion was brought forward in the 'Report of the cruise of the Porcupine,' 1870; and some naturalists still appear to hold a similar view. After stating the supposed benefits to be derived from the possession of this property by deep-sea forms, Professor McIntosh suggested that much caution is necessary in theorizing in this direction, explaining that, "In the first place, phosphorescent animals do not appear to be more abundant in the depths of the sea than between tide-marks, or on the surface, the latter, perhaps, presenting the maximum development of those exhibiting this phenomenon. Very many of the young that have been indicated as so brilliantly luminous become surface-forms soon after leaving the egg, and thus, at their several stages, more or less affect the three regions, — of surface, midwater, and bottom."

"A survey of the life-histories of the several phosphorescent groups affords at present no reliable data for the foundation of a theory as to the functions of luminosity." The irregularity of its occurrence in animals possessing the same structure and habits, the fact that the possessors of phosphorescence among annelids are often the inhabitants of tubes, or are commensalistic on star-fishes, in brief, the great variety of condition accompanying its presence in the different groups, necessitates the greatest caution in making deductions, especially if they are to have a wide application.

THE LEAVES OF THE PITCHER-PLANT.

THE *American naturalist* for June contains an interesting article by Joseph F. James, upon the evolution of the leaves of the pitcher-plant. He considers that the ancestral form belonged to the lily family, and that its home was South America, from which, in later times, it spread and modified itself in North America. He supposes that water, lodging on the upper surfaces of some leaves, was retained there; and that in this water insects were caught and drowned. Their decay might have produced a manure which assisted the plant in its growth; and the plant, finding it advantageous to have a cup-like leaf, would then, in a few generations, have developed just such a leaf as was needed. After a while, boggy land would be found better adapted for its existence, and the pitcher-plant family would be well started.

The primitive form is now lost; and the most rudimentary species is the Venezuelan genus, Heliamphora (fig. 1), which is simply a hollow tube, with a narrow opening one-fourth the way to the bottom, and with a small rudimentary hood at the

FIG. 1.

FIG. 2.

top. Nearly the whole interior of the leaf is lined with hairs, those at the bottom long and slender, and those at the top short and thick. They do not seem to be either secreting or absorbing hairs, but serve simply to prevent the escape of insects. The next advance is in our Sarracenia purpurea, so common in the eastern and northern United States. In this species, there is a more perfect tube, open only at the top, and surmounted on one side by an upright hood (fig. 2), the inner surface of which is thickly covered with short,

stiff hairs, all pointing downward. The lower third of the interior is lined with slender bristles, the middle third is perfectly smooth, and the upper part is lined with hairs similar to those in the hood. But still the pitcher is open to the rain, secretes little or no honey, and absorbs the juices of the captured insects in the form of a liquid manure only.

Sarracenia flava shows a marked difference from the preceding, in that it secretes a nectar just below the hood. In Sarracenia variolaris (fig. 3), there is a wonderful advance. The hood bends over the orifice, thus shutting out the rain: it is marked on its posterior portion with white, translucent spots, and reticulations where honey is secreted; a secretion is formed at the bottom of the pitcher, which has the peculiar property of asphyxiating its victims: and a yet more striking advance is found to be a honey-baited pathway running from the ground up along the wing of the leaf to the hood, and a short way into the orifice. A still further advance is found in Darlingtonia, a genus native to California. The hood forms a vaulted arch, mottled with spots and reticulations. The only entrance to the leaf is from below; and on each side of this entrance is a long appendage, the whole likened to a fish-tail (fig. 4). The inside of this secretes honey, and is covered with hairs. On the outside, running along the wing from the ground to the orifice, is a pathway of nectar which lures creeping insects to destruction, while the wings attract flying ones. A fluid secretion in the bottom of the cup has the power of decomposing the insects.

FIG. 3.

FIG. 4.

The flowers of these plants are also peculiarly modified for cross-fertilization; and the greatest amount of advance is found in the highest developed genus Darlingtonia, where the change has kept pace with the evolving leaves.

INSULAR FLORAS.

IT is a large quarto volume which we have before us, dealing with the botany of sundry small islands which were visited by the Challenger in her scientific cruise, made up of four reports, separately paged, and three indexes, and illustrated by sixty-five plates, which are consecutively numbered. With some arithmetical pains we ascertain that the letter-press occupies about 1,080 pages, counting in the leaves, one for each plate, upon which the figures are explained. A second volume is to contain the pelagic botany of the expedition. This one, under Mr. Hemsley's authorship, and devoted to the botany of the land and shores, concerns itself with the islands only, the continental collections of the cruise being too fragmentary, and of too well-known materials for any advantageous enumeration. Insular botany, however, has an interest of its own, — an interest quite independent of the size of the islands; for the botany even of small islands raises large and difficult questions. Moreover, their botany needs the most prompt attention; for it is everywhere undergoing rapid and irreparable deterioration and loss. At least four St. Helena plants once known to science have shared the fate of the dodo; several others are on the very eve of extinction; and no one knows how many have perished unknown and unconsecrated by scientific baptism. We are told in this volume that on St. Helena, —

> "In 1709 trees still abounded, and one, the native ebony (Melhania melanoxylon), in such quantities that it was used to burn lime with. In 1745, however, the governor of the island reported to the court of directors of the East-India company that the timber was rapidly disappearing, and that the goats should be destroyed for the preservation of the ebony, and because the island was suffering from drought. He was instructed not to destroy the goats, as they were more valuable than ebony. Another century elapsed; and in 1810 another governor reports the total destruction of the great forests by the goats, which greedily devour the young plants, and kill the old by browsing on their leaves and bark; and that fuel was so scarce that the government paid for coal (and this in a tropical climate) £2,729 7s. 8d., annually. . . . About this time the goats were killed; but another enemy to the indigenous vegetation was at the same time introduced, which has now rendered it certainly impossible that the native plants [what are left of them] will ever again resume their sway. Major-Gen. Beatson proposed and carried out the introduction of exotic plants on a large scale."

The result of which is, that a foreign vegetation, chiefly European, Australian, and South African, of about sixty phenogamous species, and most of them worthless weeds, has taken the place of the native flora, nearly all of which was peculiar to the island, and which was known to have covered it with luxuriant forests down to the water's edge. The existing remnant of this peculiar flora lingers, rather than

Report of the scientific results of the voyage of H.M.S. Challenger, during the years 1873-76. Botany, vol. i. London, *Government*, 1885. 4°.

survives, — the phenogamous part of it in only thirty-four species, — partly at some favored points near the sea, mainly in the higher and less accessible interior portions of the island. Of two or three of the trees or shrubs, only single specimens are known; while of the redwood (Melhania erythroxylon, congener of the lost ebony, and no less valuable for the hard and durable mahogany-colored wood), which formerly abounded, only two indigenous trees survive, and hardly over a dozen planted ones.

Turning to the Bermudas, — the botany of which is exhaustively treated in the early part of the present volume, and, indeed, for the first time, — we have another example of the common fate of the aboriginal vegetation of small islands in low latitudes whenever opened to immigration. From the cultivated grounds, the indigenous vegetation is of course swept away: the uncultivated ground is covered with lantanas (here called sage-bushes) from the West Indies, and with oleanders from the Old World; also with an assortment of herbaceous weeds, some of American, but more of European, origin. The three shrubs above mentioned are said to cover more ground than all the native woody species put together. Yet the oleander was brought in only seventy years ago, the lantanas twenty or thirty years earlier.

But the change in Bermuda vegetation under human agency is by no means so striking and so pitiful as that which has happened to St. Helena. No peculiar type, and, it may be presumed, no species whatever, has here been extirpated. And that, because the Bermudas have no peculiar types, and probably never had any; and it is not improbable that the three or four species reckoned as peculiar may exist elsewhere. No genus, and hardly a well-marked species, would be lost if these little islands were submerged. Indeed, St. Helena and the Bermudas well represent the two classes of islands, the differences of which our author well describes. The first is an oceanic island, far separated by broad and deep seas from all continental land: its flora, therefore, in the main very peculiar and ancient, and the source of it wholly conjectural. Bermuda is of the continental class, is near to South America and the West Indies, from which it has obviously received its plants, and at a comparatively recent period. Like all such islands, its indigenous vegetation is meagre in kinds; and while 'the things themselves are neither rich nor rare,' it is not difficult to guess whence they came, and how they got there.

"The one striking feature in the softly undulating landscape is the ubiquitous cedar, relieved here and there by clusters and isolated individuals of the palmetto." These are, indeed, the only indigenous trees in Bermuda. The palm (Sabal Blackburniana) is counted as endemic, yet with doubt whether it is not also West Indian. Its botanical history is curious, and is well worked out in this report; and so likewise of the cedar (Juniperus Bermudiana), which is also West Indian, and is very near to our common red cedar. Both trees appear to be in no danger of eradication; for they seed abundantly, and germinate freely.

The other insular floras, of which this volume collects and discusses the existing materials, are mainly those of Fernando de Noronha, Ascension, the Tristan da Cunha group, the Crozets and Kerguelen Island in the South Atlantic and Southern Oceans, Juan Fernandez and the adjacent Masafuera, near Chili, the South-eastern Moluccas, and the Admiralty Islands. Of all these, the historical and bibliographical data are carefully worked up, and the bearings of the facts upon the problems of distribution briefly indicated.

The appendix, on the dispersal of plants by oceanic currents and birds, is a full compilation of what is known respecting such dispersion, — at least, for the regions with which these reports are concerned. A list of plants, certainly or probably dispersed by oceanic currents, is given on pp. 42–44 of the Introduction. This introductory essay upon the characteristics of insular floras, with an analysis of some of them, is, perhaps, the most widely interesting portion of the volume. Mr. Hemsley tells us of his hopes, that Sir Joseph Hooker would have undertaken this; but his multifarious duties rendered it impracticable for him now to address himself to this subject, which he has formerly discussed in the most masterly way, and with the advantage of the largest personal experience. The actual author, although new to the field, has made a creditable essay. A. G.

SOME WORKS ON GEOLOGY AND GEOGRAPHY.

THE early issue of a second edition of Geikie's Geology bears witness to the success of this excellent work. The author's preface states that it has been thoroughly revised, and that by abridgment when possible, and by use of a different type from that of the first edition,

Text-book of geology. By ARCHIBALD GEIKIE. Second edition, revised and enlarged. London, 1885.

Physikalische geographie von Griechenland mit besondere rücksicht auf das alterthum. By Dr. C. NEUMANN and Dr. J. PARTSCH. Breslau, *Koebner*, 1885. 476 p. 8°.

the contents of the volume have been much increased without adding seriously to the size of the volume. The references, which made so valuable and novel a feature of the original work, are also extended, and include material as fresh as the results of Peach's and Horne's studies in the Scotch Highlands, which are alluded to with admirable frankness, although going so counter to the author's earlier work and opinions. The wonderful epitome of historic geology presented in Great Britain renders illustrations from other countries much less necessary than they would be in any other region of the same area, so that the work is essentially and intentionally British in character; but the general discussions of the first two-thirds of the volume make it a standard of reference wherever geology is studied. Mentions of progress in this country are necessarily brief, but they are well chosen and appreciative, from Whitney and Wadsworth's 'Azoic system,' which is characterized as a 'full and pungent discussion,' to Chamberlin's report on the 'Terminal moraine,' — an 'admirable summary,' with which every student of glacial geology ought to make himself familiar.

The second volume of Günther's 'Geophysik' (Stuttgart, *Enke*, 1885) follows soon after the first, which was lately noticed in *Science*. The contents are, 'Terrestrial magnetism,' 'Atmospherology,' 'Oceanography,' and the unnamed physical study of the dry land. As in the first volume, the form of treatment embraces a history and discussion of every important question, with liberal references to the literature of the subject. Under many headings the discussion is necessarily brief, and serves hardly more than to open and close the question, without occupying a middle ground concerned with details of fact; but elsewhere, when dealing with matters in which scientific discussion is still active, — as the aurora, the colors of the sky, hail, sun-spot cycles, variation of sea-level, and others, — there is fuller consideration. The two volumes show a reading of most extraordinary breadth and critical power, and form a compendium that must be indispensable to teachers and advanced students.

Dr. Partsch has completed a work begun by his teacher and predecessor, Dr. Neumann; and the result of their joint labors makes a comprehensive handbook on the physical geography of Greece. Explorations in late years by Austrian geologists, have given much material for the description of its structural history, and the climatic chapter is made thorough by aid from Dr. Hann of Vienna. Santorin receives a full account, although active volcanoes were not known in Greece at the time of its ancient flourishing. Earthquakes, on the other hand, have always been common, and the more important ones are described. Modern chronicles show certain periodicities in the occurrence of Grecian earthquakes; and this makes the loss of the ancient catalogue by Demetrius of Callatis all the more regrettable. Forel's ingenious explanation is quoted for the puzzling currents of Euripos; the six-hour currents at time of new and full moon depending on the tides from the larger basin to the south, the two-hour currents at time of lunar quadratures arising from the gentle oscillations (*seiches*) of the smaller basin on the north. A work of this monographic character is as interesting a task as the student can set before him. It brings him a wide range of acquaintance with writings on subjects allied to those he discusses, and in turn introduces him to a larger circle of readers than is attracted by most authors; and this is especially true when the task has been so well performed as in the volume before us. It is as useful to classical scholars and historians as to geographers and naturalists.

INFECTIOUS DISEASES.

THE recent rapid revolution in medical theories regarding the nature of a large group of diseases, has made antiquated the books which only a short time ago were quoted as high authority. A new text-book, therefore, by so able and polished a writer as Professor Liebermeister, must be a welcome contribution to the library of every medical student. The first volume is devoted to that group of diseases upon which is riveted the attention of all sanitarians, as well as physicians, at the present time. It deals with the infectious diseases, and the story of the hidden mysteries of this strange world of minute germs is told in a fascinating manner.

The word infection was originally applied to every form of poisoning; but it is now restricted to the pollution of the body by a special kind of poison, which has the property of reproduction and self-multiplication to an indefinite degree under favorable conditions. This power of multiplication has long been recognized in certain diseases, and has in former times led to the suspicion that the poison of those diseases consisted of particular living entities; and recent investigations have

Vorlesungen über specielle pathologie und therapie. Von DR. C. LIEBERMEISTER. Leipzig, *Vogel*, 1885. 8°.

proven to an absolute certainty that small, microscopic organisms, called micrococci, bacteria, schizomycetes, etc., are the sole cause and essence of a large number of diseases, and that without these organisms present in the body such diseases are impossible. It seems queer, that among all the mystical, visionary theories of disease imagined by the poetical fancies of the ancients, one theory, most visionary and fairy-like of all, should to-day become the established creed of sceptical science. The idea that minute organisms, visible only by certain devices of the microscopist, should invade our bodies, and, there selecting their appropriate abodes, should, by rapid multiplication, become the cause of typhoid-fever, small-pox, diphtheria, consumption, and numerous other diseases, seems like a fable; and yet such is the truth. The casting out of evil spirits is not wholly a figure of speech, and heathen incantations and the beatings of drums were but the earliest attempts to solve the problem of dislodgement which is pressing us hard at the present day.

In the introductory pages of his work, Professor Liebermeister defines and classifies the different varieties of infectious diseases in a very clear manner. He first divides those diseases into the miasmatic and the contagious. By miasmatic, he designates those diseases whose germs are primarily generated outside of, and independently of, any diseased body. Contagious diseases are those whose specific germs arise only in organisms suffering the special diseases. Contagious germs can be transferred from a sick man directly to a well man by simple contact, and they may then produce the same disease in this second person. Miasmatic germs, however, are bred in special localities, — in the soil and water, — and they attack those who come to these localities, but are not transferable from person to person. The contagious diseases, therefore, are *epidemic;* the miasmatic, *endemic.* A third group of these diseases includes a number whose germs appear to require two stages of development — first in the body, and then outside of it — before they become qualified to infect a new body. Thus cholera is not directly transferable from person to person, and men are also attacked who never saw another sick with cholera. On the other hand, it is equally certain that cholera never arises in any place outside of the East Indies, except it is brought to that place by human agency. Professor Liebermeister's explanation of these apparently contradictory facts is very logical and satisfactory. He assumes that cholera germs, when first expelled from a diseased body, are innocuous; but, falling upon suitable conditions of temperature and moisture, they develop the fatal properties which render them deadly to those who then come in contact with them. Typhoid-fever exhibits similar contradictions as regards its methods of transmission, but such contradictions become clear and harmonious in the light of this theory. The excrement of one typhoid-patient in Pennsylvania, thrown out upon the hillside to ripen its deadly poison, killed hundreds of people in the town of Plymouth a few weeks later. The necessity for the instantaneous disinfection of all the excreta of these diseases should be one of the fundamental principles of sanitation taught to every child in every school in the land. Grown-up people do not go to school, and they learn slowly. Children at the right age should be taught such matters in the proper way.

In his handling of special diseases, Professor Liebermeister is short and terse, but remarkably clear; and we most cordially recommend his work to all.

NOTES AND NEWS.

— The 'Journal of the Franklin institute' for October adds another series of composite photographs to the fast-increasing contributions in this field. They group together the historic portraits of Washington, as represented by seventeen artists. There are three composites in all, due to the variations of position in the originals; and the resemblance of the three to one another is stronger than the resemblance amongst the originals. The photographs were prepared by Mr. W. Curtis Taylor of Philadelphia, who claims for them the highest attainable accuracy. A large crayon drawing of one of the composites is exhibited at the 'Novelties exhibition' in Philadelphia.

— Dr. Heinrich Winkler, in his recently published 'Uralaltaische völker und sprachen,' has made a careful comparison of the Eskimo with the languages of northern and north-eastern Asia. He reaches the result that it is in unmistakably close relation to the Kadyak, Tschiglit, and Namollo of the Asiatic coast, but is in no way connected with the Ural-Altaic tongues. It may have orignally proceeded from the same elementary conception of speech; but it has developed a type of its own differing widely from Asiatic standards, and much more closely approaching the structure typical of the great mass of American tongues, though in many respects presenting features peculiar to itself.

— An aerostatic school is to be established at Grenoble in connection with the artillery, and will be especially devoted to teaching the use of captive balloons in reconnoitring.